63-4-1

Technical Report No. 6308

THE DEVELOPMENT OF A DYNAMIC ARCH SUPPORT

Reported by: John J. Urban

May 1963

U. S. ARMY PROSTHETICS RESEARCH LABORATORY
WALTER REED ARMY MEDICAL CENTER
WASHINGTON 12, D. C.

T. R. No. 6308*

Project: 6X59-01-001-04

Date Started: December 1962

Date Completed: May 1963

Recommend Approval:

Scientific Director

Approved:

Director

*Qualified requesters may obtain copies of this report from ASTIA.

A B S T R A C T

Materials and methods have been developed for the fabrication of dynamic arch supports. The outstanding characteristics of the new material are its quick setting attributes along with the flexible means for setting time adjustment and material consistency which permits immediate corrective possibilities.

I. Introduction

As a result of discussions among Captain John Charlton, MSC, Podiatrist, Foot Clinic, Orthopedic Service, Walter Reed General Hospital, and members of this laboratory, a need for a fast simple technique for the fabrication of arch supports was enunciated.

Present practice consists of smearing a latex filler combination having the consistency of a thick porridge into the shoe and then the shoe is fitted to the patient. As the patient walks the latex-filler combination dries and sets to a flexible solid. The main disadvantages of the process are the method of applying material, the length of the setting time, approximately three days, and the shrinkage of the latex-filler combination as a result of the drying process. In order to overcome these disadvantages it was decided to investigate the use of a room temperature vulcanizing silicone rubber for this application.

The anticipated advantages of such a material are non-toxicity, rapid reproducible setting time, as short as 15 minutes if desired, 100% reactive and minimum shrinkage. Because of these characteristics there exists the opportunity for applying corrective build-ups in a comparatively short time.

II. Materials

The materials used consisted of Silastic R.T.V. 502 or 382,[1] a room temperature curing silicone rubber, wood flour used as a bulk filler to obtain a useful working consistency for good impression quality and to make the compound more economical, and Cab-O-Sil, an amorphous finely ground silica, for imparting strength. A useful formulation contains the following ingredients:

Solid Rubber Formulation

Silastic R.T.V. 502 or 382[1]	100 g.
Cab-O-Sil[2]	2 g.
Filler (Wood Flour)[3]	20
Catalyst 502 or 382[4]	30 drops

1/ Dow-Corning Chemical Co., Midland, Michigan
2/ Godfrey L. Cabot, Inc., White Pigments Div., 77 Franklin St., Boston, Mass.
3/ Local Supplier
4/ Dow-Corning Corporation, Midland, Michigan

If a more flexible or softer full pad or combination build-up area is desired the following foam formulation may be used:

Foam Rubber Formulation

Silastic R.T.V. 502 or 382	100 g.
Cab-O-Sil	2 g.
Filler (Wood Flour)	20 g.
Silastic Foam S-5370 5/	21 g.
Catalyst 502 or 382	24 drops

It is possible to vary the setting time by varying the catalyst to resin ratios. Consistency can be altered by adjusting the filler content.

The compounding technique for the solid rubber formulation is as follows:

1. Weigh the Silastic 502 or 382 into a rubber mixing bowl.
2. Add Cab-O-Sil slowly into the Silastic using a spatula to obtain thorough mixing. Due to the small particle size and light weight of the Cab-O-Sil it must be handled carefully to preclude loss and preferably under a hood to prevent air pollution.
3. Add Wood Flour and disperse it in the mixture using a spatula.
4. Add the catalyst and mix with a spatula.

The materials cited were from a newly opened can. Since these materials have a definite shelf life it may be necessary to alter the formulation by adding more or less catalyst, etc. to obtain properly working formulations as the material ages.

To prepare the foam rubber composition, proceed through Step #3 as above, then mix in the foam Silastic S-5370 and then the catalyst, 502 or 382.

III. Processing Techniques

Two techniques were developed to prepare the arch supports.

1. APRL Template Technique

5/ Dow-Corning Corporation, Midland, Michigan

The template technique involves the use of templates as a mold to form flexible innersole patterns of controlled thickness and size to insert into the shoes. The template design is shown in Fig. 1. The template was prepared from two pieces of masonite, 9½ x 14 x 1/8 (A & B).

An outline of the innersole was first traced in the center of Section "B". Tracings of partial build-up areas, such as heels and arch sections, were outlined alongside of the initial innersole tracing "B" for use in forming corrective pads. These sections were carefully cut out using a band saw. Section "B" was then aligned over "A", four 1/8" holes drilled and the two sections were bolted together to form the mold for preparing the arch support.

In order to eliminate the necessity of a full template for each area size and thickness, prepare the template using a large size innersole. Reducing templates can then be utilized. The areas cut from the section "B" of Fig. 1 to create the cavities are not discarded. Smaller innersoles are traced on these sections and cut out in the same manner. The rim created by cutting out the new smaller innersole cavity is positioned back into the original position in the larger cavity, thus creating a smaller cavity for preparing a smaller innersole. The thickness, cavity depth, is controlled by cutting out masonite innersole fillers of the same outline as the innersole cavity in Section "B" of Fig. 1, but using a thinner stock. Example: Section "B" was made from 1/4" stock. Cut a filler from 1/8" stock and insert into cavity to create a 1/8" cavity for preparing an innersole of that thickness.

In preparing an arch support using the template mold, first select the model shown in Section A, Fig. 1 and cover it with a piece of Saran-Wrap followed by a layer of crinoline large enough to cover the selected openings in Section "B".

Sections "A" and "B" of the template mold are then bolted together and the flexible pattern is prepared by filling the proper template cavity with Silastic 502 or 392 compound (Fig. 3). The pattern is cut from the template with a scalpel (Fig. 4) wrapped in Saran-Wrap (Fig. 5) allowing border room for material flow and inserted in the shoe (Fig. 6). Prior to having the patient apply his full weight for compressing and distributing the material to obtain a weight bearing impression, the insert is adjusted to minimize wrinkles. In 12-15 minutes the material sets and the arch support is removed from the shoe (Figs. 7 & 8). If no corrective build-ups are required simply trim the arch support around the borders to prepare a comfortable fit and insert the arch support back into the shoe. If corrective build-ups, such as a higher heel, are desired the following procedure may be used:

a) Spatulate the silastic compound and fill both the heel cavity and the arch support cavity (Fig. 3) in the previously described manner. Cut both from the template mold. Remove Saran-Wrap from the heel buildup

pattern and set it on the heel section of the arch support. Wrap the assembly in Saran-Wrap and place in the shoe. Allow the patient to apply weight and after 12-15 minutes remove the arch support from the shoe and trim. This process may also be carried out in two steps by first preparing the arch support and then adding the desired build-up section.

If softer build-ups are desired formulation "B" is recommended. When adding foam build-ups or processing full foam supports, do not have patient apply weight, but keep foot suspended. Have patient cross legs or apply a prop between the upper leg and chair to prevent floor contact. The foam should be allowed free expansion and the patient instructed not to move his foot or toes.

Alternate Preform Technique

A preform is made by outlining the patient's foot with a grease pencil, on a piece of crinoline positioned over a piece of Saran-Wrap on a flat surface. Apply the Silastic 502 or 382 compound, build-up a uniform layer to fill the outlined area and over-extend 1/8" to allow for fitting the shoe. The unit is now positioned on a piece of Saran-Wrap, crinoline side up. The grease pencil outline is visible on the reverse side. Cut out pattern with scissors 1/8" beyond the traced outline. The inner sole pad is now completely wrapped in Saran-Wrap and inserted into the shoe. Follow through as previously described.

2. Direct Technique

This technique is accomplished by applying the material directly in the shoe. The material is dispersed with a spatula and then spread to an estimated thickness. The foot is wrapped in Saran-Wrap and inserted into the shoe. If the pad is to be removed, the lining of the shoe will have to be lubricated with a separating medium.
Note: When this technique is desirable the compounding of the Silastic and fillers can be pre-mixed; pre-weighed unit amounts can be wrapped in Saran-Wrap and kept in air tight cans.

Other noteworthy techniques which have been tried were:

a. A composite arch support consisting of a foam silicone rubber over silicone rubber base.

b. A foam silicone rubber over celastic preforms.

c. A silicone rubber over celastic preforms.

d. Foam silicone rubber applied to specific sections of a silicone rubber support.

Clinical Experience

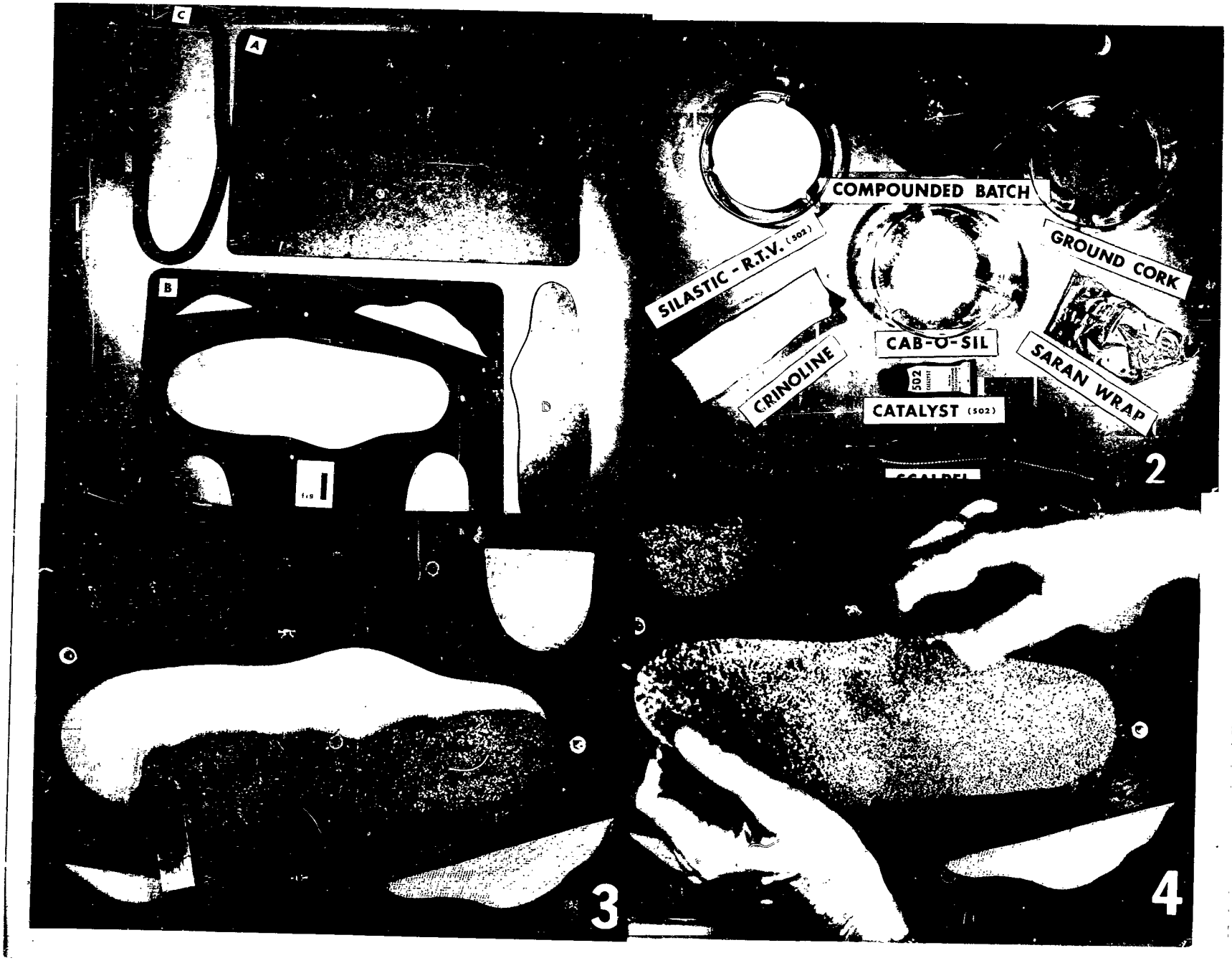
Ten patients have been fitted with arch supports prepared according to template and direct techniques. To date the results have been satisfactory. In one of the patients, who was missing all of his toes and had previously required custom shoes, it was possible using this type of arch supports to fit him with regular shoes. In two of the patients, corns were eliminated. A more extensive evaluation is contemplated.

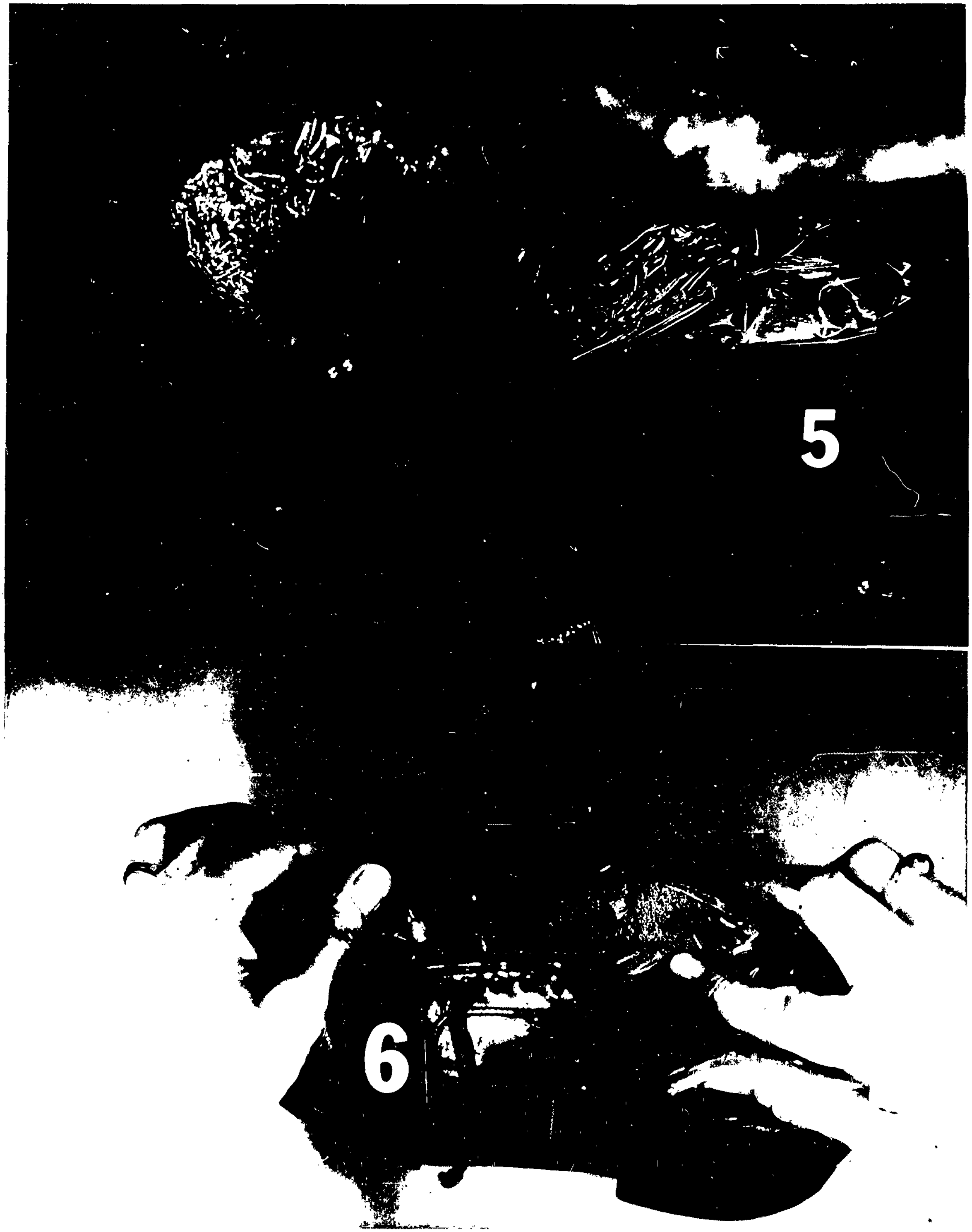
IV. Summary

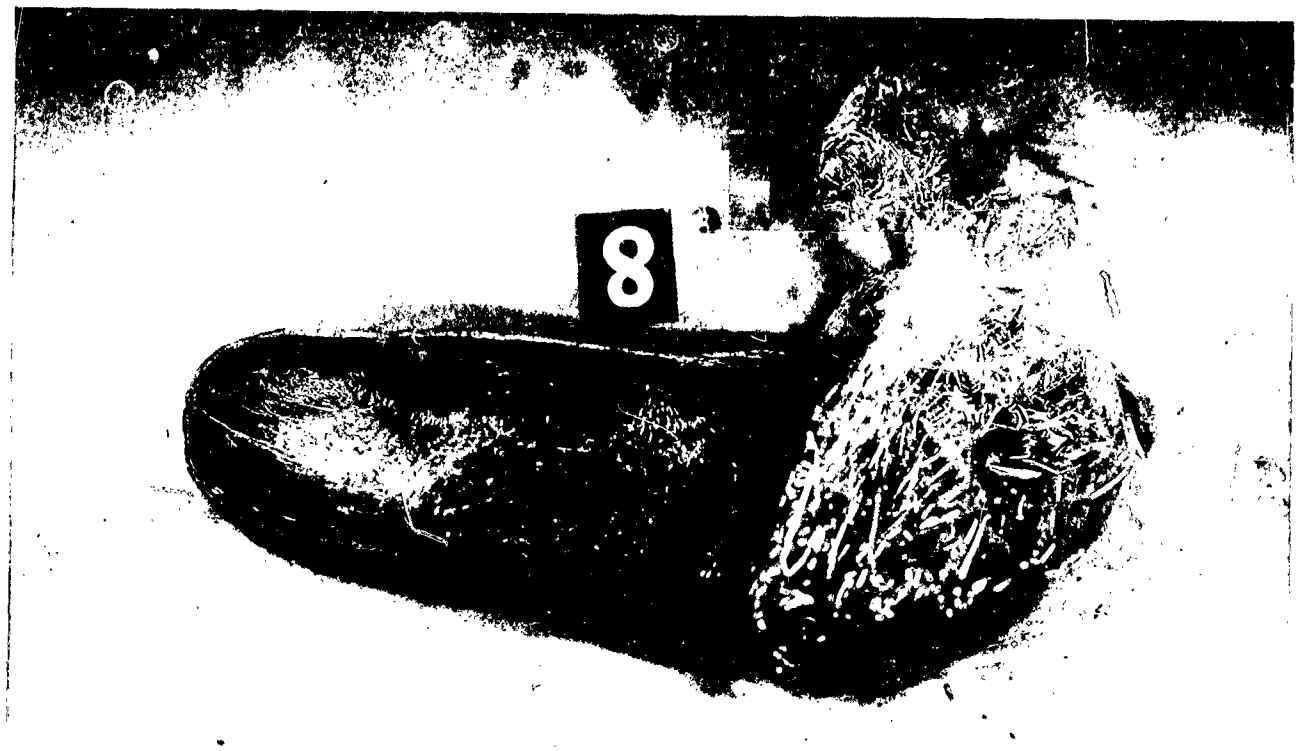
Curable liquid silicone rubber compounds have been formulated and two methods for fabricating arch supports have been developed. Preliminary clinical experience appears satisfactory.

V. References

1/ Dow-Corning Corporation, Midland Michigan
2/ Godfrey L. Cabot, Inc., White Pigments Div., 77 Franklin St., Boston, Mass.
3/ Local Supplier
4/ Dow-Corning Corporation, Midland, Michigan
5/ Dow-Corning Corporation, Midland, Michigan


C
A
B
D
3
COMPOUNDED BATCH
SILASTIC - R.T.V. (502)
GROUND CORK
CRINOLINE
CAB-O-SIL
SARAN WRAP
CATALYST (502)
2
4


5
6


8


7

ABSTRACT CARD

TITLE: The Development of a Dynamic Arch Support

AUTHOR (S): John J. Urban

AGENCY: USA Prosthetics Res. Lab.
Walter Reed AMC, Washington 12, D. C.

TECH. RPT. 6308 UNCLASSIFIED

Project 6X59-01-001-04

ABSTRACT:

Materials and methods have been developed for the fabrication of dynamic arch supports. The outstanding characteristics of the new material are its quick setting attributes along with the flexible means for setting time adjustment and material consistency which permits immediate corrective possibilities.

WRAMC FORM 0183 (ONE TIME)
15 MAY 1961

AD _____ # _____

1. Dynamic arch support
2. Silastic rubber
3.
4.

ABSTRACT CARD

TITLE: The Development of a Dynamic Arch Support

AUTHOR (S): John J. Urban

AGENCY: USA Prosthetics Res. Lab.
Walter Reed AMC, Washington 12, D. C.

TECH. RPT. 6308 UNCLASSIFIED

Project 6X59-01-001-04

ABSTRACT:

Materials and methods have been developed for the fabrication of dynamic arch supports. The outstanding characteristics of the new material are its quick setting attributes along with the flexible means for setting time adjustment and material consistency which permits immediate corrective possibilities.

WRAMC FORM 0183 (ONE TIME)
15 MAY 1961

AD _____ # _____

1. Dynamic arch support
2. Silastic rubber
3.
4.

ABSTRACT CARD

TITLE: The Development of a Dynamic Arch Support

AUTHOR (S): John J. Urban

AGENCY: USA Prosthetics Res. Lab.
Walter Reed AMC, Washington 12, D. C.

TECH. RPT. 6308 UNCLASSIFIED

Project 6X59-01-001-04

ABSTRACT:

Materials and methods have been developed for the fabrication of dynamic arch supports. The outstanding characteristics of the new material are its quick setting attributes along with the flexible means for setting time adjustment and material consistency which permits immediate corrective possibilities.

WRAMC FORM 0183 (ONE TIME)

AD _____ # _____

1. Dynamic arch support
2. Silastic rubber
3.
4.

ABSTRACT CARD

TITLE: The Development of a Dynamic Arch Support

AUTHOR (S): John J. Urban

AGENCY: USA Prosthetics Res. Lab.
Walter Reed AMC, Washington 12, D. C.

TECH. RPT. 6308 UNCLASSIFIED

Project 6X50-01-001-04

ABSTRACT:

Materials and methods have been developed for the fabrication of dynamic arch supports. The outstanding characteristics of the new material are its quick setting attributes along with the flexible means for setting time adjustment and material consistency which permits immediate corrective possibilities.

WRAMC FORM 0183 (ONE TIME)

AD _____ # _____

1. Dynamic arch support
2. Silastic rubber
3.
4.